

Middle School Lesson Guide

Energy Star School Challenge

Grade 7 Essential Academic Learning Requirements

Communications

2.5 Use a variety of media to illustrate and support ideas; use available technology as a presentation tool

3.2 Contribute to a group with suggestions, research, and effort

Mathematics

1.2 Understand the relationship among perimeter, area, and volume

4.1 Develop a plan for collecting information; organize and clarify mathematical information by reflecting, verbalizing, discussing or writing

Science

1.2 Understand that energy is a property of substances and systems and comes in many forms. . .

2.1 Design, conduct, and evaluate scientific investigations using appropriate equipment and mathematics

Suggested Lesson 5th-8th Grade

1. Brainstorm about energy with the entire class or in groups of 4 or 5. Make two lists: a list of things that use or need energy in order to function and a list of all the different kinds (forms) of energy the group can think of. After the lists have been generated, connect the energy users to the kinds of energy they use. Some may be able to use more than one form of energy. Is there an infinite supply of energy on our planet? (more or less, yes. . . the sun!) Why do we have to pay money for energy? (Although energy is not created or destroyed, it does change form, and some forms are far easier for us to use than others. . .) Explain that today we going to get an idea of how much the school pays for its energy.

2. Divide class into groups of 4 or 5 and task each group with devising a plan for measuring the area of the school building in square feet. What tools will they need? Is there more than one way to measure the area? Students should write out their plan in step by step fashion. Depending on time constraints, groups may or may not share their plans with each other before carrying them out. Sharing would allow groups to get feedback from their peers and identify pitfalls before carrying out the plans.

3. Direct groups to implement their plans for figuring out the area of the school building (in square feet). Groups then present their findings to each other and conduct both a self evaluation and a peer evaluation of their plans. What might account for discrepancies between the groups' results? What aspects of your plan worked well? What might you change if you were to do this again?

4. Ahead of time, gather energy use information from the school administration (finance office) and distribute this information to each group. (Photo copies of energy bills.) As a class, discuss what information is included on the bill and what information is needed to calculate energy use per square foot (per year). **Students enter their information into the Energy Star database.**

Extensions

Each group prepares one aspect of a presentation to be shared at a school board meeting or a PTSA meeting. One group might prepare an explanation of how the information was gathered, another group might prepare necessary visuals, another might demonstrate the use of the Energy Star database, while another might offer an analysis of what the Energy Star rating means.

Each student does an individual research project on energy use in their home and in Washington. How is energy used and in what form? Where does the energy we use in our homes come from? How does the energy efficiency of our homes compare to the energy efficiency of our school? How has energy use in the state changed over time? What are some current questions about energy use in Washington?

High School Lesson Guide

Energy Star School Challenge

Grade 10 Essential Academic Learning Requirements

Communications

2.5 Communicate messages through oral, artistic, graphic, and/or multimedia presentation; demonstrate sophisticated use of available technology

3.2 Make an individual contribution to a group and extend the contribution of others

Mathematics

1.2 Understand how changes in dimension affect perimeter, area, and volume

4.1 Develop or select an efficient system for collecting information; organize, clarify, and refine mathematical information in multiple ways

Science

1.2 Understand many forms of energy as they are found in common situations on earth and in the universe

2.1 Design, conduct, and evaluation systemic and complex scientific investigations using appropriate technology and multiple measures

Suggested Lesson 9th-12th Grade

1. Review basic concepts about energy: a) energy is not created or destroyed, but rather changes forms -- ask the class for examples from everyday life: electricity is converted into heat in our stoves and into light in our lamps; chemical energy (food) is converted into kinetic energy (motion) in a running athlete b) Review various sources of energy we use everyday and ask the class to distinguish between renewable and non-renewable sources. c) Make the distinction between energy conservation and energy efficiency. Explain that today we are going to take a first step toward understanding how our school building might use energy more efficiently by establishing a baseline for how much we use right now.

2. Divide the class into groups of 4 or 5 and task each group with devising a plan for measuring the energy efficiency of the school building expressed as energy used per square foot of space (per year). What information will be needed in order to assess this? How can this information be gathered? Each group should write out a plan for assessing the energy efficiency of the school building in a step by step fashion, such that someone unfamiliar with their plan could follow it.

3. Direct groups to implement their plans for calculating the energy efficiency of the school building. Individual group members may have and carry out different tasks such as calculating the school's square footage, researching the school's energy use (obtaining past bills from the finance office, etc.), and crystalizing the information into an understandable format.

4. Groups prepare and deliver presentations to each other, reporting on their results. They include in their reports an analysis of the methods they used (what worked well, what did not) as well as suggested areas for future study. What additional questions did this investigation raise? How might those questions be answered? **Students enter their information into the Energy Star database.** (An average may need to be taken if there are differences between the groups.)

Extensions

Each group (or interested individual students) implements its plan for calculating energy efficiency at an elementary school in their district. What information can the students gather in advance? What information must they gather on site? What information might the elementary school students be able to gather? **Enter these schools' information into the Energy Star database.**

Each student does an individual research project on current technological advances to increase energy efficiency. Are there efficiency differences between using renewable and non-renewable energy sources? What are the pro's and con's of implementing energy efficiency upgrades in a home or a school? In what other aspects of society is energy efficiency being improved?